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ABSTRACT

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Video Outside Versus Video Inside the Web: Do Media Setting and Image Size Have an Impact On the Emotion-Evoking Potential of Video?

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Abstract

To explore the educational potential of video-evoked affective responses in a Web-based environment, the question was raised whether video in a Web-based environment is experienced differently from video in a traditional context. An experiment was conducted that studied the affect-evoking power of video segments in a window on a computer screen compared to presenting the same video materials on a television monitor. The study first demonstrates that affect-evoking power of video exists. Although not always significant, the results show that selected positive and negative video clips induce positive or negative affective responses and mood changes in participants, in a Web-environment as well as in a television environment. Smaller window sizes, however, may do less well.

Introduction

Technical developments make it continually easier to use streaming as well as downloadable video in Web-based applications. This raises growing interest in the use of video segments within Web-based multimedia learning environments (see for example Collis & Peters, 2000). Video has the potential to present dynamic content. In the cognitive domain moving images with sound and accompanying voice-overs may, for instance, provide insight in technical processes and procedures. In the affective domain video materials may evoke affective responses in the learner that relate to the instructional content of interest. A well-known example is the use of trigger video's that present emotional demanding situations as input for learning experiences. These examples represent two characteristic functions of video: (a) the potential to facilitate the acquisition of knowledge and skills, and (b) the use of video to bring material into the learning environment for affective learning goals. The present study relates to this second function of video.

Affective video materials can show realistic situations and people depicted directly from reality or dramatised in story lines. Footage from real situations as well as dramatised story lines make it possible for viewers to identify themselves with persons on the screen and to become involved in the situations that those persons meet. For educational purposes this potential of video is used to evoke emotions and to stimulate discussion. Topics to be discussed may vary from historical and societal to ethical issues. Not only the content of the video is important for evoking affective responses, but there is also a contribution from production variables such as music, editing, camera handling and lighting (resulting in a "video structure"). Video content and video structure are not independent but interacting variables. Video-production techniques and their influence on the way video content is experienced are discussed in for example Wetzel, Ratke and Stern (1994) who approach video design from a research perspective, and Millerson (1999) and Zettl (1999) who draw upon the trade of film and video makers. The potential of video to evoke emotions and the relationship between video structure and video content is also a topic in communication research (for example: Geiger and Reeves, 1991; Lang, Dhillon, & Dong, 1995; Lang, NewHagen & Reeves, 1996).

Affective video materials may further have educational potential when combined with specific (creative) tasks that follow a segment. Research studies by Isen (for example Isen, Daubman, & Nowicki, 1987) and Kaufmann and Vosburg (for example Kaufmann and Vosburg, 1997, Study 2) show that video segments used to evoke emotions can influence the performance on a task that follows the video segment. The content of the video segments that they used was not related to the task, but served merely to induce an affective response or mood in the subjects. Their work shows, however, that video may be considered as an effective emotion-evoking or "mood-induction-technique", a finding which is confirmed in a review by Gerrards-Hesse, Spies, and Hesse (1994).

The tasks involved in the research of Isen and Kaufmann and Vosburg are (creative) problem-solving tasks, varying from categorization, association, developing insight, to divergent thinking tasks. Positive and negative mood states seem to be related to the way a problem-solving task is carried out. Their results suggests that a positive-affect video could be more effective for a certain type of task and a negative-affect video for another type of task. For a recent model about the influence of mood on problem solving, see for example Vosburg and Kaufmann (1999).

Affective video materials implemented in a Web-based learning environment are expected to be potentially similarly effective for reaching specific pre-defined affective goals and for having a mood-inducing function that stimulates the solving of specific problems. As an additional effect affective video might also contribute a sense of "warmth" to a technological system like a Web-based environment which may help to maintain interest in the learning task.

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This study is a step in exploring these expectations by first trying to confirm that video has indeed the potential of evoking affective responses and mood changes in subjects in a traditional setting for watching television. Subsequently we will examine whether video materials presented in a Web-like environment have a similar effect.

Video materials in a Web-based learning environment are presented in a video window that is smaller than video shown on a television screen. Therefore a second question is raised whether image size is a relevant design factor that influences the affective potential of video materials in a Web-environment. Research on image size of emotion-evoking movie fragments shows that screen size does indeed have an effect on how the movie is experienced. Little screens are less liked, produce less arousal and the content is remembered less compared to big screens (Reeves & Nass, 1996; Reeves, Lang, Kim & Tatar, 1999). Video materials presented in a little video window within a Web-environment may thus have less affective potential than the same videos presented in a bigger video window.

From an instructors point of view, who may be considering a shift from traditional classroom-use of video to using video within a Web-environment, it may be relevant to know whether differences exist between the two types of media settings (watching television vs. watching video in a window on a computer screen). This will be the third question of our research.

In summary, the following three research questions are stated to explore the affective potential of video materials in a Web-based environment:

1. Are video materials that are selected for their potential to evoke either positive or negative affective responses and mood changes in participants, effective when the video is presented:
   a)within a traditional television-viewing setting (group or individual setting), or
   b)within a Web-like environment (individual setting).

If this is the case:

2. Does image size have an effect on the magnitude of affective responses and mood changes in participants (within Web setting; within television setting).
3. Does the media setting have an effect on the magnitude of affective responses and mood changes in participants (between television and Web)?

Method

To study these questions, an experiment was carried out that is specified below.

Participants

The participants for the experiment were 117 first-year university students in communication studies (82 women and 35 men, mean age = 18.5 years). The experiment was part of a course that introduces the field of media communication and media research and was introduced as an introduction to doing experiments. The results of the experiment and the experience of the students in participating in the experiment were discussed in class a month after the experiment.

Materials

For the selection of affect-evoking video materials, video segments of about two or three minutes were used from existing films or television programs. In a pilot study situated in a traditional classroom setting, six video clips were tested with students for the affective responses they evoked. Some of the clips showed positive content (content that is expected to evoke positive feelings), other clips showed negative content. The pilot showed that two of the positive video clips and two of the negative video clips were effective. For both affect types the briefest clips where selected for the experiment. Selecting the short clips seems justified by the fact that Web users are used to brief presentations. The shorter clips are thus more realistic to embed in a Web-environment than longer clips (5 minutes or longer). In the experimental setting the positive video content consisted of a segment from the comedy movie 'When Harry met Sally' (2'45"); the negative video content was a news-item about 'Hunger in Ethiopia' (2'04"). Half of the subjects were shown first the negative content and then the positive content. For the other half this was the other way around. To 'buffer' the impact from one type of affective content to the other a video segment was presented in-between (a segment from an instruction video on welding, 2'27"). To establish a comparable starting position for all subjects a video segment was added as a first video clip for all participants. This segment was a part of a documentary about birds (1'53").

Design and procedure

An experimental factorial pretest-posttest design with three factors was chosen. Factor one is the 'affective content of the video' (positive versus negative). Factor two represents the 'playback size of the video' (little versus big; the bigger size is linear two times the smaller size, resulting in an image area that is four times the smaller size). Factor three is 'media type' (television monitor versus computer monitor). All three factors were studied with settings for individual participants. In addition to the individual settings a group setting was introduced as an extra factor to explore social effects that may influence the magnitude of affective responses to video.

Subjects were randomly assigned to one media type setting and within this setting to one video playback size. A matching procedure was used for the variable male/female. Subjects received in advance information about the location of the experiment and the allocated time for it. At the entrance of the experimental room the subjects were given a number to a specific 'seat' in the room. For each seat the presentation order of the positive and negative video segment was predetermined. The two versions were:

Version 1: clip2=positive and clip4=negative, and
Version 2: clip2=negative and clip 4 = positive.

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All subjects encountered both positive and negative video contents. Table 1 shows the order of clips in all settings.

Table 1. Overview of the experimental conditions

	INDIVIDUAL TELEVISION SETTING	INDIVIDUAL COMPUTER SETTING
Small	Small television monitor (14", S-VHS-PAL) docu – pos – instr – neg docu – neg – instr – pos	Small video window (320*240 pixels, screen resolution: 1024*768) docu – pos – instr – neg docu – neg – instr – pos
Big	Big television monitor (28", S-VHS-PAL) docu – pos – instr – neg docu – neg – instr – pos	Large video window (640*480 pixels, screen resolution: 1024*768) docu – pos – instr – neg docu – neg – instr – pos
	SOCIAL TELEVISION SETTING	
Big	Big television monitor (28", S-VHS-PAL) docu – pos – instr – neg docu – neg – instr – pos	

Note:
docu = segment from a documentary about birds
instr = segment from an instruction video about welding
pos = segment from 'When Harry met Sally'
neg = segment from a news-item about 'Hunger in Ethiopia'

The experiment was conducted in four rooms:

- Room 1: Big television-monitor setting;
- Room 2: Little television-monitor setting.
- Room 3: Computer setting (for all computer conditions for small and large video windows);
- Room 4: Big television monitor in a social setting.

The individual arrangements were in such a way that the viewing angles for the television and the computer conditions were the same: Watching the big television monitor took place with the same viewing angle as watching the large video window on the computer screen; watching the small television monitor took place with the same viewing angle as watching the small video window on the computer screen. To accomplish this, viewing distances were carefully controlled.

Four experiment monitors and four assistants were hired and instructed. In advance students of the course were informed about the research group (time, and location) to which they were assigned. They were asked to gather in a central location in the building, so that no current sessions would be disturbed. Each experiment monitor for a certain condition (room) invited his/her group to go to the room. The assistants waited for the participants at the room. Upon entering the room, the assistants gave each participant their seat number (see above). They were asked to read the information about the experiment, fill in their name and wait silently for the experiment monitors to start the experiment. They also had to sign an attendance list for the course administration. A few days before and at the day of the experiment some students attended that were not in the register that was used for the assignment procedure. Because of the course credits they were allowed to participate and assigned to the different settings.

The experiment monitors gave a brief introduction to the experiment. The procedure and the instruments (questionnaires) where automated into a (web-like) computer-based environment. For the computer setting this was done to create the look and feel of a Web-environment. To be consistent in the overall procedure the individual television-monitor settings also used this environment for filling in the digital questionnaires. Thus in both settings the same procedures were used. In the social television-monitor setting printouts of the instructions and questionnaires were used.

In the computer setting the video clips were announced and shown within this setting. The video clips were shown as part of a separate almost full-screen window to provide a neutral (dark grey) background and was followed by a questionnaire. In the television-monitor setting the participants used the computer for filling in questionnaires and switched to watching a television monitor when a video clip had to be started. In this condition the video clips were available on tape in a video player. The videotape contained all four video clips. Each video clip was preceded by 10 seconds of black screen and the clip's title (like

"Video clip 1") to assure enough time for the VCR to start playing and as confirmation for the participants that the correct clip was started. After each clip a message to stop the tape was presented.

Scoring

Instruments. A questionnaire containing bipolar affect and mood items using a 7-point Likert scale for response was used to assess the affect-evoking and mood change potential of the positive and negative video materials. Non-relevant items about cognitive responses (evaluations of the videos) and arousal items were included to make the aim of the experiment less obvious to the participants. A questionnaire consisted of three sections: A section with questions about the mood state of the participants (including also arousal items), a section about the feelings evoked by the video clip (affective responses) and a section with questions about the opinions (evaluations) about the video clip. As mentioned in the design and procedure section the instruments (questionnaires) where automated into a (web-like) computer based environment and presented after viewing a video clip. To prevent that participants would develop a repetitious way of filling out the questionnaires, the order of the sections in each questionnaire was varied and also the direction of the items. Since the second and the fourth video clip were the actual affective video clips of interest in the experiment, the section of the questionnaire that measured the mood state was always placed in such a way that a pretest – posttest measurement of these clips could be made. The last section of the questionnaire belonging to the first video clip was the mood section, because this was meant to be the pre-test measure for the second clip. The first section after viewing the second clip was again the mood section as a post-test measure. For the fourth clip the same strategy was used.

The final Mood scale consisted of three items, the final Affect scale consisted of five items (Figure 1).

Mood scale: three items:			Affect scale: five items:		
Very negative (1)	-	Very positive (7)	Very negative (1)	-	Very positive (7)
Very unpleasant (1)	-	Very pleasant (7)	Very unpleasant (1)	-	Very pleasant (7)
Very somber (1)	-	Very cheerful (7)	Very somber (1)	-	Very cheerful (7)
			Very sad (1)	-	Not at all sad (7)
			Very happy (1)	-	Not at all happy (7)

Figure 1. Rating scales for mood and feeling

A reliability analysis of the mood items showed that the three items together produced a mood scale with an average Cronbach's alpha score of .88. Originally there were six feeling items. They produced a reliability score of .85. When one of the feeling items (very involved / not at all involved) was deleted, the alpha score increased and resulted in an average score of .90. (See Table 2). The reliability scores for the Mood scale and the Affect scale are thus quite acceptable.

Table 2. Cronbach's alpha scores for the final mood and feeling scale

	Mood Scale (3 items)	Affect Scale (5 items)
Questionnaire 1 (clip1)	.7758	.8487
Questionnaire 2 (clip2)	.9358	.9811
Questionnaire 3 (clip3)	.8452	.8007
Questionnaire 4 (clip4)	.9557	.9842
Mean questionnaires	.8781	.9037

Results

Homogeneous treatment groups

The first video clip and accompanying questionnaire served as a pre-test measure for all treatment groups. An analysis of variance (one way anova) showed no significant differences between the groups on the Mood scale and the Affect scale (Mood scale $F[9,116]=1.048$, $p=.407$ and Affect scale $F[9,116]=.606$, $p=.790$). The treatment groups can be considered homogeneous on the dependent variables.

Group sizes and gender. The average group size was n=12 (11.7). On the average 29.9% of the participants were male and 71.1% were female. Data showed, however, that two treatment groups were different from the other groups. The treatment group "computer / small video / version 2 (clip2=neg, clip4=pos)" appeared to have a relatively small number of participants (n=6). For the treatment group "television / small video / version 2 (clip2=neg, clip4=pos; n=9)" atypical male/female proportions were observed of 66.7% en 33.3% respectively.

Affective responses and Mood changes

Within television settings. First we wanted to confirm whether positive and negative video materials could evoke affective responses and mood changes in participants within a traditional television viewing setting (both social and individual). A paired-T-test was conducted for the settings with television. In this analysis the first clip (documentary) was compared with the second clip (being positive in version 1 and negative in version 2).

For the positive clip significant effects were found in all television settings for a change in evoked affective responses. Only in the individual small television setting no significant mood changes for the positive clip were found (p=.358).

The negative video clip produced in all television settings significant effects for a change in mood state and in evoked affective responses.

Within Web settings. For the positive clip significant effects for mood change and feeling change were found in the Web setting with the large video in both versions. For the small video's no significant effects were found on mood changes (p=.119) and changes in affective responses (p=.078). The negative video clip produced in all television settings significant effects for a change in mood state and in evoked affective responses.

Comparisons of image-size within a media-setting

Procedure. As the data showed that two treatments groups of version 2 appeared to have a relatively small number of participants or an atypical male/female proportion, the analyses of the results will be based on version 1. In that version the sequence of the clips was clip 2 = positive and clip 4 is negative. For the exploration of image-size effects version 1 is taken as starting point for within-media-type comparisons. Clip 1 (documentary) had a slightly positive score for mood and affect and Clip 3 (instruction) had a slightly negative score on mood and affect. Both are, however, sufficiently close to the middle of the scale to be regarded as "neutral clips".

Both for the Mood scale and the Affect scale only change scores are presented (not the absolute scores). Change scores are more informative because they represent the pretest-posttest differences in the line of the intentions of the experiment.

Within TV-setting: Big versus little TV. For the big tv-monitor setting (n=11) and the little tv-setting (n=15) the mean change scores for mood state and affective responses were compared. With one small exception the bigger video seemed to have more impact than the smaller video both for the positive video (clip 2) and the negative video (clip 4), see Table 3 and Figure 2 and 3 (third and fourth treatment setting). A T-test (for two independent samples) showed a significant effect on mood change for the positive clip (clip 2) with $T(24,26)=2.156$, p=0.041 (two-tailed).

Table 3. Video setting: Sample sizes, Means, Standard Deviations and Standard Errors for Mood and Affect Change Scores by treatment

Change scores	Treatment	n	Mean	St. Deviation	Std. Error Mean
Mood change clip2	tv/big video	11	3.55	1.44	.43
	tv/small video	15	.93	3.81	.98
Mood change clip3	tv/big video	11	-5.82	3.68	1.11
	tv/small video	15	-3.07	4.67	1.21
Mood change clip4	tv/big video	11	-2.00	2.10	.63
	tv/small video	15	-2.60	3.04	.79
Affect change clip 2	tv/big video	11	7.27	5.39	1.62
	tv/small video	15	6.40	9.04	2.33
Affect change clip3	tv/big video	11	-13.27	4.86	1.47
	tv/small video	15	-9.73	8.19	2.11
Affect change clip4	tv/big video	11	-8.82	3.82	1.15
	tv/small video	15	-6.73	3.99	1.03

Note:
Statistics for Version 1 of Clip sequence: Clip2=positive; Clip3=instruction; Clip4=negative

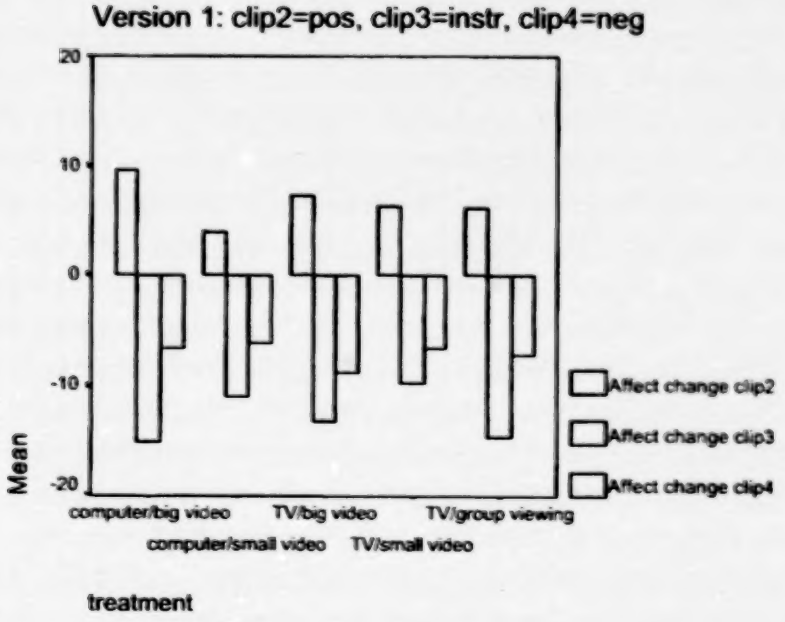

Figure 2: Bar Graph of Mean Change Scores for Mood (Version 1 sequence of video clips)

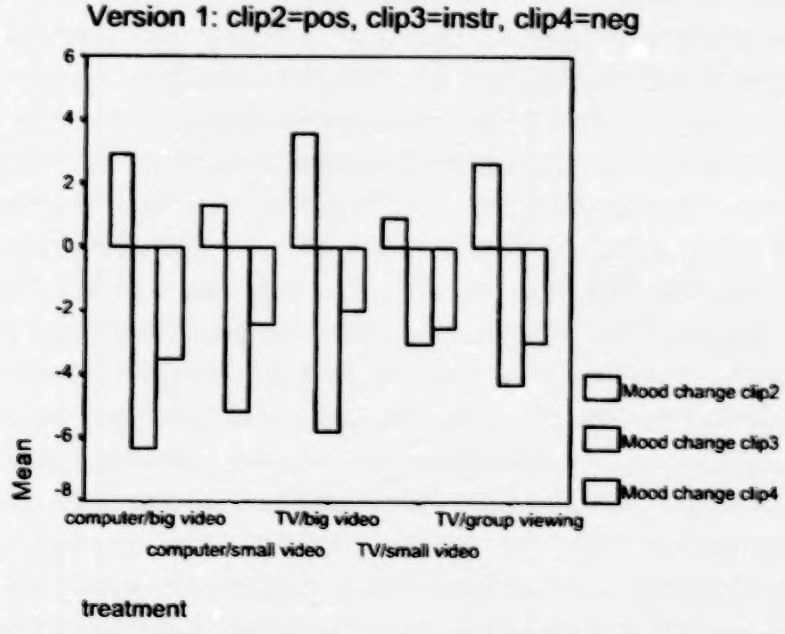

Figure 3: Bar Graph of Mean Change Scores for Affect (Version 1 sequence of video clips)

Within Web-setting: Big versus little video play-back size. In the Web-setting the bigger video play back size (n=14) and the smaller play back size (n=13) were compared. Without exception the bigger playback size always produced a larger mean score for mood change and affect change than the smaller video size as is shown in Table 4 and Figure 2 and 3 (first and second treatment setting). A T-test (for two independent samples), however, showed that these differences were not significant. When we look at the female participants only within the Web-setting (n=9 for both image sizes), we did found significant differences for image size for affect change by the second clip, the positive clip (p=.033, two-tailed) and for the third clip, the slightly negative clip (p=.029, two-tailed).

Table 4. Web setting: Sample sizes, Means, Standard Deviations and Standard Errors for Mood and Affect Change Scores by treatment

Change scores	Treatment	n	Mean	Std. Deviation	Std. Error Mean
Mood change clip2	computer/big video	14	2.93	4.01	1.07
	computer/small video	13	1.31	2.81	.78
Mood change clip3	computer/big video	14	-6.36	5.00	1.34
	computer/small video	13	-5.23	4.21	1.17
Mood change clip4	computer/big video	14	-3.57	3.48	.93
	computer/small video	13	-2.46	2.50	.69
Affect change clip2	computer/big video	14	9.57	7.78	2.08
	computer/small video	13	3.92	7.33	2.03
Affect change clip3	computer/big video	14	-15.21	5.99	1.60
	computer/small video	13	-11.00	5.82	1.61
Affect change clip4	computer/big video	14	-6.64	6.27	1.68
	computer/small video	13	-6.15	2.94	.82

Note:
Statistics for Version 1 of Clip sequence: Clip2=positive; Clip3=instruction; Clip4=negative

Comparisons of media-settings: Web versus television

Although comparisons between media types are difficult to make, because different media and viewing context variables are at stake, we wanted to explore whether media setting (media type plus viewing context) might have effect on the magnitude of affective responses and mood changes. This could be a relevant question for instructors in their media selection process. Therefore the Web-settings and the television settings were compared. First the smaller image sizes and then the larger image sizes in both settings were compared. As mentioned in section 'Design and procedure', we controlled for viewing angle to exclude differences between the settings on this variable. T-Test showed that no significant differences between the media settings were found. A comparison of the small video-playback size in the Web setting (n=9) with a big television monitor applied in a classroom-like presentation (n=10) showed no significant effects. When however the big video playback size (n=14) within the Web-setting was compared with the small television setting (n=15) a significant effect was found. In this case the Web-setting produced more impact on mood state and affective responses than the television setting (p=.049, two-tailed).

Discussion

One of the most powerful characteristics of video media is their potential to evoke emotions. This is one of the reasons why video material is often selected for educational purposes. This study raised the question whether affective video in a WEB-based environment is experienced differently from video in a traditional context and whether video image size is a relevant factor to consider in this context. The key question is in short: "Affective video in a Web: Does it work ?".

We started this paper with the expectations that affective video materials might indeed work when implemented in a Web-based learning environment. Media-setting (Computer[Web] versus television), affective video content (positive versus negative) and image size (big versus small) were the three key factors in the experiment. Another factor, social versus individual viewing situation, was introduced to see whether this is a relevant aspect of the media-setting to consider. For an overview of the treatment groups we refer to Table 1.

The results show that we found evidence for the affective potential of video for both media settings. Only in the individual television setting with the small monitor this effect was not significant on mood changes for the positive video clip as second clip. Also in the Web-environment we found that the affective video materials were effective in evoking affective responses and changes in mood. Again the small positive clip as second clip was the exception to this rule. The reason why the positive clip as

second clip did less well in the small image settings, might have to do with the character of the first clip. This clip (documentary about birds) was also experienced as (slightly) positive, which reduced the room for further positive change of mood or affect. The fact that in some cases the smaller video's didn't work, made the question about image size even more relevant. In general, however, we can conclude that affective video materials can be effective when embedded in a Web-based environment.

As far as image size is concerned, in almost all treatment groups the larger image size seemed to have more impact than the smaller video for both affective clips. This 'pattern', however, was only significant for mood change for the positive clip (clip 2) in the television setting. When we looked at the female participants within the Web-setting we did found significant differences (although two tailed) for image size on affect change by the affective video clips (including the third clip). With the relatively small sample sizes (on average n=12) in this study it is, however, not easy to find significant differences between the treatment groups. We suggest for further studies the use of larger sample sizes, controlling for gender, and a broader range of affective clips to explore the image-size issue more in depth. It is, for instance, unknown whether the impact of mood or affect change on performance is subject to threshold levels. Small differences in the amount of change could then be critical, which may add importance to findings such as in this study.

Not only may image size have an impact on affective responses and mood changes, but also on arousal (another aspect of emotion) and attention. A study by Reeves, Lang, Kim and Tatar (1999) about the effects of screen size and message content showed that image size can increase attention and arousal for audio-visual messages. Arousing pictures, like sex and violence for example, produced higher levels of arousal when presented on a large screen than presented on a medium or small screen (screen sizes were respectively 56 inch, 13-inch and 2 inch picture heights). Also larger images were remembered better the smaller images. It would be interesting to explore these issues within a Web-environmental context, also to find out whether Reeves, Lang, Kim and Tatar are right when they state that "The inclusion of display size as an important variable in media research seems critical (p. 64)."

One of our purposes was to explore from an instructors point of view whether a shift from traditional classroom or individual use of video to an individual Web-based learning environment would have an impact on the way in which the same affective video materials are experienced by students. A comparison between the two media-settings in this study (television versus Web) was made. No significant effects were found with one exception: The large videos within a Web-environment evoke stronger affective responses and mood changes than the small television monitor. This might be the case because the image size was perhaps experienced as relatively big because of the short viewing distance to the monitor in the computer set ting.

This study could not reveal effects for viewing affective video materials in a group. This was expected, but the actual experimental setting was probably too atypical for a social viewing session because of the procedure and the questionnaires. The session was primarily experienced as a laboratory setting. Laughs or other sounds made aloud were rare. In future research a more realistic viewing situation should be created.

For the measurement of the affective responses and mood states we used Likert-scales for response. A disadvantage of this type of measurement is that it is subjective and that it asks for insight in one's feelings and mood. We would recommend the use of more objective instruments like physical measurement techniques, if available, to contribute to the validity of this type of research.

In conclusion. When we return to the question: "Affective video in a Web: Does it work ?", the answer is that in most cases it does, but with smaller window sizes it might do less well. Which leads for the time being to a general advice for applying videos in the affective domain: Try not to compromise on image size when shooting or selecting affective video materials for the Web.

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